REMARKS

Status of the Claims

By this amendment, claims 1, 4-7, 9-27, 29-36 and 39-54 are pending in the application. Claims 2-3, 8, 28 and 37-38 are being canceled. Claims 1, 6-7, 12, 16-19, 22-25, 27, 29, 32-36, 41, 47-49 and 51 are being amended. The claim amendments are supported by the specification and original claims, and no new matter is being added. Thus, entry of the amendments and reconsideration of the present case is requested.

Allowed Claims

Applicants appreciate the Examiner's indication of allowance of claims 39 and 40, and the Examiner's indication that claim 38 would be allowable if re-written in independent form and including all of the limitations of its base claim.

Objection Under 37 C.F.R. 1.75(c) of Claims 6, 48 and 49

The Examiner rejected claims 6, 48 and 49 under 37 C.F.R. 1.75(c) as being of improper dependent form for "failing to further limit the subject matter of a previous claim." This rejection is traversed.

Claim 6, as amended, recites "a method according to claim 1 wherein the treating of the chamber comprises cleaning a surface of a wall in the chamber." Claim 6 is properly dependent from claim 1, which recites "A method of treating a chamber to at least partially remove residue from surfaces in the chamber." Thus, claim 6 further

limits the subject matter of claim 1 by specifying the surface comprises a surface of a wall. Accordingly, claim 6 is of proper dependent form and should not be objected to under 37 C.F.R. 1.75(c).

Claim 48, as amended, recites "a method according to claim 47 wherein (b) comprises providing an energized gas comprising an etchant gas comprising one or more of Cl_2, N_2, O_2, HBr, and He-O_2." Claim 48 is properly dependent form claim 47, which recites, in (b) "providing an energized gas in the chamber to etch through the metal silicide containing layer." Thus, claim 48 further limits the subject matter of claim 47 by specifying a composition of etchant gas. Accordingly, claim 48 is of proper dependent form and should not be objected to under 37 C.F.R. 1.75(c).

Claim 49, as amended, recites "A method according to claim 47 wherein (b) comprises providing a fluorinated gas comprising one or more of CF_4, SF_6, and NF_3." Claim 49 is properly dependent form claim 47, which recites, in (b) "providing an energized gas in the chamber to etch through the metal silicide containing layer, the energized gas comprising a fluorinated gas." Thus, claim 49 further limits the subject matter of claim 47 by specifying a composition of the fluorinated gas. Accordingly, claim 49 is of proper dependent form and should not be objected to under 37 C.F.R. 1.75(c).

Objection to Claim 37

The Examiner objected to claim 37 without specific reference to a 37 C.F.R. section, and requested "the formulation of alternative claim language" to prevent misreading of the claim.

Applicant's believe that the claim language in claim 37 would not have

led to misreading of the claim. However, as claim 37 is being canceled with this amendment, this objection is now obviated.

Rejection Under 35 U.S.C. 112, Second Paragraph, of Claims 32-34 and 36

The Examiner rejected claims 32-34 and 36 under 35 U.S.C. 112, second paragraph, for "failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." This rejection is traversed.

Claims 32-33, as amended, recite an "etchant gas," thus referring to the etchant gas recited in their base claim. Thus, claims 32-33 particularly point out and distinctly claim the subject matter and should not be rejected under 35 U.S.C. 112, second paragraph.

Claim 34, as amended, recites "a method according to claim 27 wherein the fluorinated gas comprises a fluorinated cleaning gas, and wherein a volumetric flow ratio of etchant gas to fluorinated cleaning gas is from about 1:1 to about 20:1." Thus, claim 34 recites an "etchant gas" as in its base claim, and further recites that the fluorinated gas of its base claim comprises a fluorinated cleaning gas, the etchant gas and fluorinated cleaning gas being provided in a volumetric flow ratio. Thus, claim 34 clearly points out and distinctly claims the subject matter, and should not be rejected under 35 U.S.C. 112, second paragraph.

Claim 36, as amended, recites "a method according to claim 35 wherein, during (b), the volumetric flow ratio of etching gas to residue cleaning gas is from about 1:1 to about 20:1." Thus, claim 36 clearly points out and distinctly claims the subject matter by specifying that the volumetric flow ratio is provided during (b), which is the etching stage recited by its base claim. Thus claim 36 should not be rejected over 35

U.S.C. 112, second paragraph.

Rejection Under 35 U.S.C. 102(b) of Claims 1-6, 7-37 and 46-54

The Examiner rejected claims 1-6 under 35 U.S.C. 102(b) as being anticipated by Japanese Patent Publication No. 01050427 to Hiroyuki et al. This rejection is traversed.

Claim 1 is not anticipated by Hiroyuki et al because Hiroyuki et al does not teach "providing an energized second process gas in the chamber to further treat the surfaces in the chamber and to assist in de-chucking the substrate from the electrostatic chuck," as recited in the claim. Instead, Hiroyuki et al teaches that "a wafer 4 is taken out of a chamber 2" and that "thereafter, self-cleaning gases (CF_4 and O_2) and introduced into the chamber 2." (Constitution, first and second sentences.) Thus, Hiroyuki et al teaches providing a cleaning gas in a chamber after removing a wafer from the chamber, but does not teach providing a gas in the chamber while the substrate is in the chamber, to assist in de-chucking the substrate. Thus, Hiroyuki et al fails to teach each and every aspect of the claim, and claim 1 and the claims depending therefrom are not anticipated by Hiroyuki et al

The Examiner rejected claims 7-15, 17-26, 35-37, 51 and 53 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,180,464 to Tatsumi et al. This rejection is traversed.

Claim 7 is not anticipated by Tatsumi et al because Tatsumi et al fails to teach:

"(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated

gas;

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer; and

(d) in a third stage conducted after (c), providing an energized second cleaning gas in the chamber that is different from the first cleaning gas," as recited in the claim.

Instead, Tatsumi et al teaches that an "oxygen plasma treatment was interposed between the etching and the overetching of the polycide film 5" (column 8, lines 44-46), wherein the polycide film comprises a DOPOS layer and a metal silicide layer. Thus, Tatsumi et al teaches etching at least a part of a metal silicide layer, then providing an oxygen plasma, followed by completion of etching of the metal silicide layer and DOPOS layer. Tatsumi et al does not teach etching through both a metal silicide containing layer and a polysilicon containing layer before providing an energized cleaning gas in the chamber, as in the claim. Thus, claim 7 and the claims depending therefrom are not anticipated by Tatsumi et al.

Claim 19 is not anticipated by Tatsumi et al because Tatsumi does not teach:

"(b) etching a first material on the substrate thereby depositing a first etchant residue on the surfaces in the chamber;

(c) after (b), etching a second material on the substrate while suppressing deposition of a second etchant residue onto the first etchant residue, the first etchant residue being compositionally different from the second etchant residue; and

(d) after (c), providing a cleaning gas in the chamber and coupling RF power to energize the cleaning gas to clean the first and second etchant residue

deposits formed on the surfaces in the chamber," as recited in the claim.

Instead, Tatsumi et al teaches an oxygen plasma treatment interposed between etching and overetching of a polycide film, in which "microwave discharge was carried out for 5 seconds under the conditions of the oxygen gas flow rate of 50 sccm, microwave power of 850 W and RF bias power of 0 W" (column 8, lines 53-56.) Thus, Tatsumi et al teaches providing a microwave plasma treatment, but does not teach coupling RF power to energize a cleaning gas. Thus, claim 19 and the claims depending therefrom are not anticipated by Tatsumi et al.

Claim 35 has been amended to incorporate the limitations of objected to claim 38, and thus claim 35 and the claims depending therefrom are believed to be allowable. Furthermore, claim 35 is not anticipated by Tatsumi et al because Tasumi et al fails to teach "cleaning the residue formed on the surfaces in the chamber and assisting in dechucking the substrate from the electrostatic chuck using another energized gas comprising oxygen," as recited in the claim. Instead, as discussed above, Tatsumi et al teaches an oxygen plasma treatment step interposed between etching and overetching steps. Since Tatsumi et al teaches the overetching step after the oxygen plasma treatment step, Tatsumi et al fails to teach cleaning residue and assisting in de-chucking with an energized gas comprising oxygen. Thus, claim 35 and the claims depending therefrom are not anticipated by Tatsumi et al.

Claim 51 is not anticipated by Tatsumi et al because Tatsumi et al does not teach:

"(b) providing a first energized gas in the chamber to etch the first layer;

(c) providing a second energized gas in the chamber to etch the second layer and at least partially remove the etchant residue formed on the surfaces

in the chamber in (b); and

(d) providing an energized cleaning gas to at least partially remove residues formed on surfaces in the chamber in (b) and (c)," as recited in the claim.

Instead, as discussed above, Tatsumi et al teaches an oxygen plasma treatment step interposed between an etching step and an overetching step. Thus, Tatsumi et al fails to teach providing a cleaning gas to remove residues remaining after first and second gases have been provided to etch first and second layers, and claim 51 and the claims depending therefrom are not anticipated by Tatsumi et al.

The Examiner rejected claims 7-15, 19-26, 35-37, 47-49 and 51 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,354,417 to Cheung et al. This rejection is traversed.

Claim 7 is not anticipated by Cheung et al because Cheung et al fails to teach:

"(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated gas;

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer; and

(d) in a third stage conducted after (c), providing an energized second cleaning gas in the chamber that is different from the first cleaning gas," as recited in the claim.

Instead, Cheung et al teaches a main etch step to etch a MoSix layer and

an overetch step "carried out to etch the underlying polysilicon layer below the MoSix layer" (column 8, lines 40-42), wherein "overetching was carried out using ... a mixture of gases comprising HBr,Cl_2 and He" (column 8, lines 44-46.) Thus, Cheung et al fails to teach a third stage of providing a second energized cleaning gas after etching through the polysilicon layer. Instead, Cheung teaches a first main etching step and a second over etching step, and fails to teach a subsequent step of providing a cleaning gas. Thus, claim 7 and the claims depending therefrom are not anticipated by Cheung et al.

Claim 19 is not anticipated by Cheung et al because Cheung et al fails to teach:

"(b) etching a first material on the substrate thereby depositing a first etchant residue on the surfaces in the chamber;

(c) after (b), etching a second material on the substrate while suppressing deposition of a second etchant residue onto the first etchant residue, the first etchant residue being compositionally different from the second etchant residue; and

(d) after (c), providing a cleaning gas in the chamber and coupling RF power to energize the cleaning gas to clean the first and second etchant residue deposits formed on the surfaces in the chamber," as recited in the claim

Instead, as discussed above, Cheung et al teaches a first etching step and a subsequent over etching step, but fails to teach providing an energized cleaning gas in the chamber to clean first and second process residues after etching first and second materials. Thus, claim 19 and the claims depending therefrom are not anticipated by Cheung et al.

Claim 35 has been amended to incorporate the limitations of objected to

claim 38, and is thus believed to be allowable. Furthermore, claim 35 is not anticipated by Cheung et al because Cheung et al fails to teach "cleaning the residue formed on the surfaces in the chamber and assisting in dechucking the substrate from the electrostatic chuck using another energized gas comprising oxygen," as recited in the claim. Instead, as discussed above, Cheung et al teaches only a main etching and an overetching step, and does not teach providing an energized gas comprising oxygen to clean and assist in de-chucking. Thus, claim 35 and the claims depending therefrom are not anticipated by Cheung et al.

Claim 47 is not anticipated by Cheung et al because Cheung et al fails to teach:

"(b) providing an energized gas in the chamber to etch through the metal silicide containing layer, the energized gas comprising a fluorinated gas;

(c) after (b), providing an energized gas consisting essentially of O_2 in the chamber to at least partially remove etchant residue from the surfaces in the chamber," as recited in the claim.

Instead, as discussed above, Cheung et al teaches a main etching step followed by an overetching step, the overetching step being "carried out using ... a mixture of gases comprising HBr, Cl_2, He and O_2" (column 8, lines 44-46.) Thus, Cheung fails to teach an energized gas consisting essentially of O_2, and instead teaches a gas comprising O_2 plus HBr, Cl_2 and He. Thus, claim 47 and the claims depending therefrom are not anticipated by Cheung et al.

Claim 51 is not anticipated by Cheung et al because Cheung et al fails to teach:

"(b) providing a first energized gas in the chamber to etch the first layer;

(c) providing a second energized gas in the chamber to etch the second layer and at least partially remove the etchant residue formed on the surfaces in the chamber in (b); and

(d) providing an energized cleaning gas to at least partially remove residues formed on surfaces in the chamber in (b) and (c)," as recited in the claim.

Instead, as discussed above, Cheung et al teaches performing a main etch to etch a MoSix layer step and an overetch step to etch a polysilicon layer. Cheung et al fails to teach a subsequent step of providing an energized cleaning gas to clean residues formed during the etching of first and second layers. Thus, Cheung et al fails to teach each and every aspect of the claim, and claim 51 and the claims depending therefrom are not anticipated by Cheung et al.

The Examiner rejected claims 27-34 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,378,311 to Nagayama et al. This rejection is traversed.

Claim 27 is not anticipated by Nagayama et al because Nagayama et al fails to teach:

"(b) providing a first energized gas comprising a fluorinated gas in the chamber, the first energized gas comprising an etchant gas to etch the metal silicide containing layer on the substrate; and

(c) providing a second gas in the chamber and energizing the second gas by coupling RF power to the second gas to at least partially remove etchant residue from the surfaces in the chamber and simultaneously remove residual charge accumulated in the substrate," as recited in the claim.

Instead, Nagayama et al teaches that, "after the etching of the underlying

resist layer ... the switch 11 is turned off not to apply the RF bias, as shown in Figure 2B ... then a He gas is introduced into the processing chamber and the microwave is re-supplied" (Column 6, lines 25-31.) Thus, Nagayama et al teaches etching with RF power, and then shutting off the RF power and energizing a He gas with microwaves. This is further demonstrated in Figures 2A through 2d, which show the RF power source (reference number 13) being connected during the etching stage of 2A, and show disconnection of the RF power source during an exhaust stage (Figure 2B) and the He stages (Figures 2C and 2D). Thus, Nagayama et al fails to teach providing a second gas in the chamber and energizing the gas by applying RF power to at least partially remove etchant residue from surfaces and simultaneously remove residual charge. Accordingly, claim 27 and the claims depending therefrom are not anticipated by Nagayama et al.

The Examiner rejected claims 7-16, 18, 27-33 and 46-50 under 35 U.S.C. 102(b) as being anticipated by European Patent Application No. 0709877A1 to Saito et al. This rejection is traversed.

Claim 7 is not anticipated by Saito et al because Saito et al fails to teach:

"(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated gas;

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer; and

(d) in a third stage conducted after (c), providing an energized second cleaning gas in the chamber that is different from the first cleaning gas," as recited in the claim.

Instead, Saito et al teaches that an "etching process is conducted using a mixture gas of HBr of 120 sccm and O_2 of 4 sccm" (column 5, lines 20-22) and that "an ashing process is conducted .. using as an ashing gas a mixture gas of O_2 300 sccm and CHF_3 15 sccm" (column 5, lines 38-30.) Thus, Saito et al teaches etching with the non-fluorinated gases HBr and O_2, and teaches ashing with O_2 and a fluorinated gas, CHF_3, but does not teach etching a metal silicide containing layer with a fluorinated gas. Thus, claim 7 and the claims depending therefrom are not anticipated by Saito et al

Claim 27 is not anticipated by Saito et al because Saito et al does not teach:

"(b) providing a first energized gas comprising a fluorinated gas in the chamber, the first energized gas comprising an etchant gas to etch the metal silicide containing layer on the substrate; and

(c) providing a second gas in the chamber and energizing the second gas by coupling RF power to the second gas to at least partially remove etchant residue from the surfaces in the chamber and simultaneously remove residual charge accumulated in the substrate," as recited in the claim.

Instead, as discussed above, Saito et al teaches providing a non-fluorinated gas comprising HBr and O_2 to etch a substrate, and teaches providing O_2 and a fluorinated gas, CHF_3 to ash the substrate, but does not teach etching a metal silicide containing layer with a fluorinated gas. Thus, as Saito et al fails to teach each and every aspect of the claim, claim 27 and the claims depending therefrom are not anticipated by Saito et al.

Claim 47 is not anticipated by Saito et al because Saito et al fails to

teach:

"(b) providing an energized gas in the chamber to etch through the metal silicide containing layer, the energized gas comprising a fluorinated gas;

(c) after (b), providing an energized gas consisting essentially of O_2 in the chamber to at least partially remove etchant residue from the surfaces in the chamber," as recited in the claim.

Instead, as discussed above, Saito et al fails to teach providing an energized gas comprising a fluorinated gas to etch a metal silicide containing layer, and instead teaches etching with a non-fluorinated gas, and providing a fluorinated gas, CHF_3, to ash a substrate, instead of etching a metal silicide containing layer. Thus, claim 47 and the claims depending therefrom are not anticipated by Saito et al.

The Examiner rejected claims 7-12, 14-15 and 51-54 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,164,330 to Davis et al.

Claim 7 is not anticipated by Davis et al because Davis fails to teach:

"(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated gas;

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer; and

(d) in a third stage conducted after (c), providing an energized second cleaning gas in the chamber that is different from the first cleaning gas," as recited in the claim.

Instead, Davis teaches a three step etching process in which that "the first step ... removes approximately 50-60% of the refractory metal layer ... The second step removes most of the remaining refractory metal layer ... [and] the third step removes any traces of refractory metal" (column 3, lines 40 -52.) Thus, Davis et al fails to teach providing first and second energized process gases to etch metal silicide and polysilicon-containing layers, and instead only teaches etching one refractory metal layer. Furthermore, Davis et al fails to teach providing an energized second cleaning gas after the etching stages, and instead only teaches providing gases to etch the substrate. Thus, Davis et al fails to teach each and every aspect of the claim, and claim 7 and the claims depending therefrom are not anticipated by Davis et al.

Claim 51 is not anticipated by Davis et al because Davis et al fails to teach:

"(b) providing a first energized gas in the chamber to etch the first layer;

(c) providing a second energized gas in the chamber to etch the second layer and at least partially remove the etchant residue formed on the surfaces in the chamber in (b); and

(d) providing an energized cleaning gas to at least partially remove residues formed on surfaces in the chamber in (b) and (c)," as recited in the claim.

Instead, as discussed above, Davis et al teaches etching a single refractory metal layer in three etch steps. Thus, Davis et al fails to teach providing a first energized gas to etch a first layer and providing a second energized gas to etch a second layer. Davis et al also fail to teach providing a cleaning gas to remove residues formed on surfaces during etching of the second layer, and instead only teaches the etching steps. Thus, claim 51 and the claims depending therefrom are not anticipated by Davis et al.

Rejection Under 35 U.S.C. 102(e) of Claims 7-15, 17-18, 35-37 and 41-42

The Examiner rejected claims 7-15, 17-18 and 35-37 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 5,874,363 to Hoh et al. This rejection is traversed.

Claim 7 is not anticipated by Hoh et al because Ho et al does not teach:

"(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated gas;

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer; and

(d) in a third stage conducted after (c), providing an energized second cleaning gas in the chamber that is different from the first cleaning gas," as recited in the claim," as recited in the claim.

Instead, Hoh et al teaches "etching a metal silicide layer in metal silicide/polysilicon composites with an etching gas containing HCl and chlorine (Cl_2)" (column 2, lines 61-63.) Hoh et al further teaches that "addition of similar small amoutns of an etching accelerator, like NF_3, or oxygen (O_2) may be added to the etchant gas flow" (column 3, lines 39-41.) Thus, Hoh et al fails to teach providing first and second gases to etch a metal silicide containing layer and a polysilicon containing layer, and instead teaches providing a single etchant gas to etch a single layer. Hoh et al also fails to teach providing an energized second cleaning gas after etching of the layers. Thus, Hoh et al fails to teach each and every aspect of the claim, and claim 7

and the claims depending therefrom are not anticipated by Hoh et al.

Claim 35 has been amended to incorporate the limitations of objected to claim 38 and is thus claim 35 and the claims depending therefrom are believed to be allowable. Furthermore, claim 35 is not anticipated by Hoh et al because Hoh et al does not teach "cleaning the residue formed on the surfaces in the chamber and assisting in dechucking the substrate from the electrostatic chuck using another energized gas comprising oxygen," as recited in the claim. Instead, as discussed above, Hoh et al teaches an etchant gas composition for etching a metal silicide layer, but does not teach cleaning residues from surfaces in the chamber and assisting in de-chucking the substrate with an energized gas comprising oxygen. Thus, claim 35 and the claims depending therefrom are not anticipated by Hoh et al.

The Examiner rejected claims 41 and 42 as being anticipated by U.S. Patent No. 5,817,534 to Ye et al. This rejection is traversed.

Claim 41 is not anticipated by Ye et al because Ye et al does not teach:

"providing an energized first process gas in the chamber to clean the surfaces in the chamber ... [and] adjusting a chamber source power applied to the antenna about the chamber to control the amount of residue removed from the surfaces."

Instead, Ye et al teaches that "to clean the ceiling 25 during wafer processing, an RF-driven capacitive cleaning electrode 80 is placed over the outside surface of the ceiling" (column 5, lines 46-48.) In other words, Ye et al teaches providing a capacitive electrode that is driven by RF power to clean surfaces, but does not teach adjusting a chamber source power applied to an antenna about the chamber

to control the amount of residue removed from the surface. Thus, as Ye et al fails to teach each and every aspect of the claim, claim 41 and the claims depending therefrom are not anticipated by Ye et al.

Rejection Under 35 U.S.C. 103(a) of Claims 41-45

The Examiner rejected claims 41-45 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,620,615 to Keller in view of Ye et al.

Claim 41 is patentable over Keller in view of Ye et all because neither of the references teach "providing an energized first process gas in the chamber to clean the surfaces in the chamber ... [and] adjusting a chamber source power applied to an antenna about the chamber to control the amount of residue removed from the surfaces," as recited in the claim. Instead, as the Examiner notes, Keller fails to teach adjusting a chamber source power applied to an antenna about the chamber to control the amount of residue removed from the surfaces. Instead, Keller teaches "an etchant chemistry for cleaning tungsten (W) or tungsten silicide (WSix) films from the walls of a deposition chamber ... [comprising] NF_3 and HeO_2 at a temperature ranging from -20°C to 100" (column 2, lines 37-42.) Thus, Keller teaches providing an etchant gas to clean a chamber, but does not teach adjusting a chamber source power applied to an antenna about the chamber to control cleaning if the chamber. Ye et al also fails to discuss adjusting a source power applied to an antenna about the chamber, as discussed above, and instead teaches adjusting an RF power applied to a capacitive electrode. Thus, Ye fails to make up for the deficiencies of Keller, and claim 41 and the claims depending therefrom are patentable over Keller and Ye et al.

CONCLUSION

The above-discussed amendments and remarks are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

JANAH & ASSOCIATES
A PROFESSIONAL CORPORATION

Date: December 17, 2001

By: _____
Ashok K. Janah
Reg. No. 37,487

Please direct all telephone calls to:

Ashok K. Janah
(415)538-1555

Please continue to send correspondence to:

Patent Counsel
APPLIED MATERIALS, INC.
P.O. Box 450A
Santa Clara, California 95052

MARKED-UP CLAIMS FOR S/N: 09/362,924

1. (twice amended) A method of treating a chamber to at least partially remove residue from surfaces in the chamber, the method comprising:

(a) transferring a substrate into the chamber and electrostatically holding the substrate on an electrostatic chuck:

(a) providing an energized first process gas comprising one or more of CF_4, SF_6 and NF_3 in the chamber to treat the surfaces in the chamber; and

(b) providing an energized second process gas in the chamber to further treat the surfaces in the chamber and to assist in de-chucking the substrate from the electrostatic chuck, the second process gas being different than the first process gas.

6. (amended) A method according to claim 1 wherein the treating of the chamber comprises cleaning a surface of a wall in the chamber.

7. (amended) A method of etching a substrate comprising a metal silicide containing layer and a polysilicon containing layer in a chamber and cleaning etchant residue formed on surfaces in the chamber, the method comprising the steps of:

(a) placing the substrate comprising the metal silicide and polysilicon containing layers in the chamber;

(b) in a first stage, providing an energized first process gas in the chamber to etch through the metal silicide containing layer, the first process gas comprising a substrate etching gas and a first cleaning gas comprising a fluorinated gas; [and]

(c) in a second stage conducted after (b), providing a second energized process gas in the chamber to etch through the polysilicon containing layer;

and

[(c)](d) in a [second] third stage conducted after (c), providing an energized second [process gas in the chamber, the second process gas comprising a second] cleaning gas in the chamber that is different from the first cleaning gas.

12. (amended) A method according to claim 7 wherein the substrate etching gas comprises a gas capable of etching a [metal] tungsten silicide layer on the substrate.

16. (amended) A method according to claim 7 wherein in step (a), the substrate is electrostatically held on an electrostatic chuck in the chamber, and in step (d) [(c)] comprises providing an electronegative plasma of second [process] cleaning gas.

17. (amended) A method according to claim 7 wherein in the [second] third stage, the chamber pressure is maintained at from about 1 mTorr to about 10mTorr.

18. (amended) A method according to claim 7 wherein in the [second] third stage, the ratio of source power to bias power is from about 5:3 to about 40:1.

19. (amended) A method of etching a substrate in a chamber and cleaning etchant residue from surfaces in the chamber, the method comprising the steps of:

(a) placing the substrate in the chamber;

(b) etching a first material on the substrate thereby depositing a first etchant residue on the surfaces in the chamber;

(c) after (b), etching a second material on the substrate while

suppressing deposition of a second etchant residue onto the first etchant residue, the first etchant residue being compositionally different from the second etchant residue; and

(d) after (c), providing a cleaning gas in the chamber and coupling RF power to energize the cleaning gas to clean [cleaning] the first and second etchant residue deposits formed on the surfaces in the chamber.

22. (amended) A method according to claim 21 wherein the [first gas comprises a first cleaning gas and the] second gas comprises [a second] another cleaning gas.

23. (amended) A method according to claim 22 wherein the [first cleaning] second gas comprises a fluorinated cleaning gas.

24. A method according to claim 23 wherein the fluorinated cleaning gas comprises one or more of CF_4, SF_6 and NF_3.

25. (amended) A method according to claim [22] 19 wherein, in (d), the [second] cleaning gas comprises an oxygen containing gas.

27. (twice amended) A method of etching a substrate comprising a metal silicide containing layer in a chamber and at least partially removing etchant residue from surfaces in the chamber, the method comprising the steps of:

(a) electrostatically holding the substrate comprising the metal silicide containing layer in the chamber;

(b) providing a first energized gas comprising a fluorinated gas in the chamber, the first energized gas comprising an etchant gas to etch the metal silicide containing layer on the substrate; and

(c) providing a second [energized] gas in the chamber and energizing the second gas by coupling RF power to the second gas to at least partially remove etchant residue from the surfaces in the chamber and simultaneously remove residual charge accumulated in the substrate.

29. (amended) A method according to claim [28] 27 wherein the fluorinated gas comprises one or more of CF_4, SF_6 and NF_3.

32. (amended) A method according to claim 27 wherein the [etching] etchant gas comprises a gas capable of etching a [metal] tungsten silicide layer on the substrate.

33. (amended) A method according to claim 27 wherein the [etching] etchant gas comprises one or more of Cl_2, N_2, O_2, HBr and He-O_2.

34. (amended) A method according to claim 27 wherein the fluorinated gas comprises a fluorinated cleaning gas, and wherein a volumetric flow ratio of [etching] etchant gas to [residue] fluorinated cleaning gas is from about 1:1 to about 20:1.

35. (amended) A method of etching a substrate in a chamber and cleaning residue that forms on surfaces in the chamber, the method comprising the steps of:

(a) placing the substrate in the chamber and electrostically holding the substrate on an electrostatic chuck;

(b) in an etching stage, etching one or more materials on the substrate using energized gas, at least one composition of the energized gas including an etching gas comprising one or more of Cl_2, N_2, O_2, HBr and He-O_2; and a residue

cleaning gas comprising one or more of CF_4, SF_6 and NF_3; and

(c) cleaning the residue formed on the surfaces in the chamber and assisting in dechucking the substrate from the electrostatic chuck using another energized gas comprising oxygen.

41. (amended) A method of cleaning a chamber to remove residue from surfaces in the chamber, the chamber having an antenna about the chamber, and the method comprising the steps of:

(a) providing an energized first process gas in the chamber to clean the surfaces in the chamber; and

(b) adjusting [the] a chamber source power applied to the antenna about the chamber to control the amount of residue removed from the surfaces.

47. (twice amended) A method of etching a substrate in a chamber and at least partially removing etchant residue from surfaces in the chamber, the method comprising:

(a) supporting the substrate comprising in the chamber, the substrate having a metal silicide containing layer thereon;

(b) providing an energized gas in the chamber to etch through the metal silicide containing layer, the energized gas comprising a fluorinated gas;

(c) after (b), providing an energized gas consisting essentially of O_2 in the chamber to at least partially remove etchant residue from the surfaces in the chamber; and

(d) after (c), removing the substrate from the chamber.

48. (amended) A method according to claim 47 wherein (b) comprises providing an energized gas comprising an etchant gas comprising one or more of Cl_2,

N_2, O_2, HBr, and He-O_2.

49. (amended) A method according to claim 47 wherein [(c)] (b) comprises providing [an energized gas comprising a cleaning] a fluorinated gas comprising one or more of CF_4, SF_6, and NF_3.

51. (amended) A method of etching a substrate in a chamber and at least partially removing etchant residue from surfaces in the chamber, the method comprising:

(a) supporting the substrate in the chamber, the substrate having a first and a second layer thereon;

(b) providing a first energized gas in the chamber to etch the first layer; [and]

(c) providing a second energized gas in the chamber to etch the second layer and at least partially remove the etchant residue formed on the surfaces in the chamber in (b); and

(d) providing an energized cleaning gas to at least partially remove residues formed on surfaces in the chamber in (b) and (c).